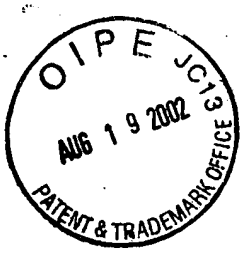

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PATENT – TRADEMARK OFFICE

Docket No. 9925-36938

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	**PATRICK J. TOOMEY**	Group No.	**2878**
Appl. No.:	**10/075,728**	Examiner:	**Gagliardi, Albert J.**
Filing Date:	**FEBRUARY 12, 2002**		
Entitled:	**WATER DETECTION AND SOURCE IDENTIFICATION METHODS FOR STRUCTURES USING ELECTROMAGNETIC RADIATION SPECTROSCOPY**		

RESPONSE TO REQUIREMENT FOR INFORMATION MAILED ON OR ABOUT JUNE 20, 2002

Commissioner of Patents and Trademarks
BOX AMENDMENT
Washington, DC 20231

Attn: Examiner Albert J. Gagliardi

This Response and accompanying Preliminary Amendment are submitted to address issues raised in the Requirement for Information mailed on or about June 20, 2002 setting a two-month period for response. A request and check for the fee of $55 for a one-month extension of time is attached to this Response, thereby extending the period for response by an additional month.

The following Response and information are respectfully provided to the Examiner.

STATEMENT OF MAILING BY EXPRESS MAIL

I hereby certify under 37 C.F.R. § 1.10 that this correspondence is being deposited with the United States Postal Service by Express Mail Label No. EV025489372US addressed to: Commissioner of Patents and Trademarks, **BOX AMENDMENT - FEE**, Washington, DC 20231, on August 19, 2002.

Jon M. Jurgovan -Reg. No. 34,633

1. Information Related to the State of the Prior Art as It Pertains to Methods of Detecting Moisture in Structures and the Equipment Employed in Such Methods now abandoned,

The parent application, U.S. Patent Application No. 09/338,906, was filed June 23, 1999. This application claims priority under 35 U.S.C. §120 to its parent application. Hence, it is assumed that information regarding the state of the art applies to that existing prior to the filing date of the parent application, or more than one year prior to such date, depending upon the specific provision of 35 U.S.C. 102/103(a) that defines the prior art.

Visual Inspection – The most common technique for analyzing moisture problems in structures is visual inspection. Most repair and remediation companies employ this technique, which unfortunately cannot uncover hidden water problems in structures such as buildings or homes. Since water problems often originate a distance away from visual manifestations of the problem, visual inspection is very limited in its ability to detect and solve water problems. One way to enhance visual inspection is by removing wall, floor or ceiling sections to visually locate a water problem. Of course, this is disadvantageous in that it is destructive and necessitates repair of the structure. In addition, there is no guarantee that destruction will reveal the source of the problem.

Capacitance Testing – A capacitance meter can be used to detect moisture in a structure such as a building or house due to the fact that the electrical capacitance of an area of a structure varies depending upon whether moisture is present. Equipment using this method includes Wet-Wall Detector equipment from Tramex, Isle of Dublin, Ireland and various models from Protometer, Ltd. of Marlow, England. Attached is a listing of present products of Tramex. It is not known whether any of these specific products were commercially available prior to the effective filing date of this application, June 23, 1998, but this listing is attached for informational purposes as to the nature of such products (see Exhibit 1).

Conductance/Resistance Testing – Electrical pins can be driven into a structure, a voltage applied across the pins, and the conductance or resistance measured. Structural materials tend to be more conductive in the presence of water. Accordingly, the

measured conductance or resistance can reveal the presence or absence of moisture in a structure. The main disadvantage of the method is that it is destructive to a limited degree and thus may necessitate repair of the structure after use of the method. Some commercially available equipment can be used for non-destructive resistance testing, but the surface area over which it operates is very limited. Equipment using this method included various models from Protometer, Ltd. of Marlow, England.

Optical Endoscopic Probe – An optical endoscopic probe can be inserted into an opening in a wall to visually examine a wall cavity for the presence of moisture. In some cases, the method can be practiced non-destructively by removing an electrical outlet cover and inserting the probe therein to examine an interior wall space. If no opening is present in a wall, an opening may be required to be cut into a wall to permit passage of the probe. The endoscopic probe originated in the medical industry for internal examination of patients, and numerous sources have existed for these products. Attached is a product description from UXR, Inc., Simi Valley, California representative of this class of equipment (see Exhibit 2).

Infrared Inspection – This passive technique relies on infrared camera equipment that basically detects infrared energy from a structure to determine if there is a water problem. Although this technique is generally effective in detecting water problems because it has the ability to view through exterior surfaces into a wall cavity or other areas of a structure not visible to the eye, it depends upon differences in temperature between moist and dry surfaces of a structure to permit detection of a water problem. Hence, in cases in which the moist and dry surfaces have the same temperature, it is more difficult to distinguish moist and dry areas. Applicant invented the technology of U.S. Patent No. 5,886,636 in part to solve this problem. This method involves changing the temperature of a structure. Dry areas move to a changed temperature faster than wet areas so that contrast is developed between the dry and wet areas to permit them to be more readily distinguished via infrared equipment. Model Prism D.S. from F.L.I.R. Corporation of Portland, Oregon or Model 550 from Agema Corporation, Newark, N.J. or Model PM 380 from Inframetrics Corporation of Billerica, Massachusetts are

representative of the class of equipment that can be employed in this method. Essentially, these are tripod-mountable infrared cameras. Attached is a listing of current products of F.L.I.R. Corporation, which has now acquired the Agema and Inframetrics companies identified above (see Exhibit 3).

pH Testing – pH testing permits determination of whether the source of a water problem is rain. A litmus paper or electronic instrument can be used to determine the source of moisture as rain if the water is relatively acidic. Conversely, if the water is not relatively acidic, rain can generally be ruled out as the source of the moisture. PH testing is thus an aid in distinguishing rain as a source of moisture in a structure, as opposed to other sources such a plumbing leak, condensation or ground water. Attached is a product listing from Omega Corporation showing various pH measuring devices. Although it is not known whether any of these products were commercially available more than one year before the filing date of the parent application, the attached listing is provided for informational purposes as to the nature of these products (see Exhibit 4).

Salinity Testing – Ground water contains salts, so determining the salinity of water from a moist area of a structure is useful in determining whether a water problem is originating from earth outside the structure. Attached is a product listing from Omega Corporation showing a salinity measuring device. It is not known whether this specific product was commercially available more than one year before the filing date of this application, but this listing is representative of the general nature of such products (see Exhibit 5).

2. Names of Any Products or Services Incorporating Claimed Subject Matter

As described at page 8, line 31 – page 10, line 16 of the specification, the generator 12 can be one or more lamps (e.g., quartz-halogen) or lasers. As described at page 11, line 9 – page 15, lines 23 of the specification, the sensor unit 14 can include photodiodes arranged in an array, such as charge-coupled device (CCD) or charge-injected device (CID). The generator 12 and the sensor unit 14 can be a unit such as the hyperspectral imaging system from Opto-Knowledge Systems, Inc., the Model No. A109000 and Model No. A126530 from Analytical Spectral Devices, Inc., Boulder,

Colorado, or the GZ5 microwave sensing system from Geozondos Corporation of Lithuania.

3. Provide Names of Any Products or Services that have Incorporated the Disclosed Prior Art as it Relates to the Detection of Moisture, Particularly Moisture in Buildings or Other Structures

The products or services incorporating the disclosed prior are identified in item (1) above.

4. State Specific Improvements of the Subject Matter in Claims 8, 10-13, 16-32, 34-37, and 39-53 over the Disclosed Prior Art and Indicate the Specific Elements in the Claimed Subject Matter that Provide These Improvements. For Means or Step Plus Function, Please Provide the Specific Page and Line Number within the Disclosure which Describe the Claimed Structure and Acts

Claim 8 is recited as follows:

> 8. A method comprising the steps of:
>
> a) exposing with a generator a predetermined area of a structure with first electromagnetic radiation including at least one predetermined wavelength that is significantly absorbed by water;
>
> b) sensing with a sensor unit second electromagnetic radiation from the structure, the second electromagnetic radiation based on the first electromagnetic radiation; and
>
> c) determining whether the water exists in the structure, based on the second radiation sensed in said step (b),
>
> the predetermined area of the structure exposed in said step (a) being at least one square meter.

The prior art methods and equipment are generally passive and do not use an electromagnetic radiation generator to actively expose a structure with electromagnetic radiation absorbed by water. Addressing the claimed patentable distinctions in connection with each of the prior art methods, infrared inspection involves passive detection of radiation emitted from a structure. If moist and dry areas of the structure are at the same temperature, distinguishing the two with infrared detection is difficult. In

contrast, active exposure of the structure with radiation absorbed by water can be used to more readily determine the presence of moisture in a structure because the water suspect area absorbs the first radiation and generates resulting second radiation based thereon if water is present in the structure. The active exposure method is thus not dependent upon ambient conditions due to the fact that water, if present, is actively induced to react to the first radiation to generate the second radiation for sensing. Visual inspection may use ambient room or sunlight incident on a structure in an effort to detect the presence of water, but the light sensed by the eye is that reflected from the surface of the structure, which light has thus not been absorbed by the water. The recited Claim is thus distinguishable from the visual inspection method in that the light used for detecting is reflected, not absorbed, by any moist area of the structure. Furthermore, the sensing is performed with the unaided eye, not a sensor unit as recited in Claim 8 as amended. Similar comments relative to the visual inspection method apply to the endoscopic probe method. An endoscopic probe may use a light source to image interior wall spaces, but the sensed light is what is reflected, not absorbed, by any moist area. The limitation of Claim 8 indicating the exposed area of the structure is at least one square meter distinguishes methods such as capacitance testing or conductive resistive testing which are much more limited in the extent to which they can measure for the presence of water. More specifically, these techniques are generally limited to sensing an area for moisture over roughly one-hundred square centimeters. In contrast, the claimed method can cover over ten-thousand square centimeters in a single scan. This means that with the claimed invention the time and effort required to scan a given area of a structure for the presence of moisture is greatly reduced as compared to the prior art. pH and salinity testing do not use electromagnetic radiation, so Claim 8 patentably distinguishes over these methods.

Steps (a) – (c) of Claim 10 are identical to those of Claim 8 and thus for similar reasons to those stated above with respect to Claim 8, Claim 10 patentably distinguishes over the prior art. Steps (d) and (e), although not individually new, have been recited in a new combination with steps (a)-(c) of Claim 10. Steps (d) and (e) provide the capability to perform a test to confirm or disaffirm the presence of water in a moisture-suspect area.

Claim 11 depends from Claim 10 and includes all of the limitations of that claim and so is patentable at least for the reason of its dependency from Claim 10. In addition, Claim 11 recites a step of determining the source of water confirmed as present in a structure. Although this step is not individually new (see Applicant's U.S. Patent No. 5,886,636), it is new in combination with the other steps of the claimed method.

Claim 12 recites:

> 12. A method comprising the steps of:
>
> a) exposing with a generator a predetermined area of a structure to electromagnetic radiation including at least one predetermined exposure wavelength significantly absorbed by water, and at least one predetermined reference wavelength that is not significantly absorbed by water;
>
> b) sensing with a sensor unit electromagnetic radiation from the exposed predetermined area of the structure at a predetermined detection wavelength that is sensitive to the exposure wavelength if water is present in the exposed predetermined area of the structure, and that is not sensitive to the exposure wavelength if water is not present in the exposed predetermined area of the structure, and at the reference wavelength;
>
> c) determining whether the exposed predetermined area of the structure includes a water-suspect area, based on the electromagnetic radiation sensed in said step (b) at the detection and reference wavelengths;
>
> d) if said step (c) determines that a water-suspect area exists in the structure, testing the water-suspect area using at least one of a moisture detector, a capacitance meter, an endoscopic probe, and a resistivity meter; and
>
> e) determining whether water is present in the structure, based on the testing of said step (d).

Prior art methods for detecting moisture in structures do not use detection and reference wavelengths in radiation to expose a structure as recited in step (a), to sense radiation at a detection wavelength dependent upon the exposure wavelength and a reference

wavelength, as recited in step (b), or to determine whether water is present in the structure based on the detection and reference wavelengths in step (c). Hence, the claimed invention is patentable for this reason, in addition to those previously stated with respect to Claims 8 and 10.

Claim 13 depends from Claim 12 and includes all of the limitations of that Claim and additionally recites that the detection wavelength is the same as the exposure wavelength. The prior art technologies used to detect moisture in structures measure only light received from a structure, and do not use the fact that the absence of light due to absorption of a radiation wavelength can reveal the presence of moisture. Accordingly, Claim 13 patentably distinguishes over the prior art for this reason.

Claims 16 and 17 depend from Claim 12 and include all of the limitations of that Claim. Accordingly, for at least the reasons stated above with respect to Claim 12, Claims 16 and 17 patentably distinguish over the prior art. Furthermore, Claim 16 recites a step of determining the source of water in a confirmed water-suspect area, a step that is not known in the prior art in combination with the other recited steps of the method of Claim 16. Claim 17 recites that the area of the structure exposed in step (a) is at least one square meter. Thus, with the claimed method, water can be detected over a relatively large area in a single performance of the method so that a structure can be scanned for a water problem in a relatively short period of time as compared to prior art techniques. Accordingly, Claims 16 and 17 patentably distinguish over the prior art for these reasons in addition to those stated above with respect to Claim 12.

Claim 18 recites:

> 18. A method comprising the steps of:
>
> a) generating <u>with a generator</u> electromagnetic radiation including at least one predetermined exposure wavelength that is significantly absorbed by water and is not significantly absorbed by material composing the structure, and at least one predetermined reference wavelength that is

not significantly absorbed by water and the material composing the structure;

b) exposing with the generator a predetermined area of the structure with the generated electromagnetic radiation;

c) sensing with a sensor unit at least a portion of the generated radiation from the exposed area of the structure to determine a first intensity level of the radiation at the exposure wavelength, and a second intensity level at the reference wavelength;

d) comparing the first and second intensity levels;

e) determining that the water-suspect area includes water if the first and second levels differ by at least a predetermined amount; and

f) determining that the water-suspect area includes no water if the first and second levels do not differ by at least the predetermined amount.

Prior art methods fail to disclose any method that comprises steps (a) –(c) of generating and exposing a structure with radiation at an exposure wavelength that is significantly absorbed by water and a reference wavelength that is not significantly absorbed by water, in which neither wavelengths are absorbed by the structure, and sensing intensity levels at detection and reference wavelengths to determine in steps (e) and (f) whether a water-suspect area is or is not present in the structure. Thus, in addition to the reasons stated above with respect to Claims 8, 10, and 12, Claim 18 recites that neither the exposure nor reference wavelengths are significantly absorbed by the material composing the structure. This means that the method has the capability to detect moisture through exterior surfaces of a structure to view portions thereof that are hidden to the eye. The prior art discloses no method of actively exposing water with a wavelength absorbed by water that induces detectable radiation at a detection wavelength that indicates the presence (or absence) of water, let alone with wavelengths that are not absorbed by a structure and are therefore capable of viewing inside of portions of a structure hidden to the eye. Accordingly, Claim 18 patentably distinguishes over the prior art for this reason in addition to those stated above with respect to Claims 8, 10, and 12.

Claims 19-21, 23-25, 27-32, 34-37, and 39-53 depend from Claim 18 and include all of the limitations of that Claim. Thus, for the reasons stated above with respect to

Claim 18, Claims 19-21, 23-25, 27-32, 34-37, and 39-53 patentably distinguish over the prior art. In addition, these Claims recite additional features not disclosed by the prior art. Claims 19-21 recite positioning the generator and sensor unit relative to the structure. The prior art fails to disclose these features of the claimed invention in combination with the other claimed steps. Prior art methods such as visual inspection cannot be used to position room light or sun light in any practical manner. In contrast, in the claimed method the generator and sensor unit can be positioned to actively expose and sense for the presence of water in an area of the structure. Moreover, Claim 21 recites that the sensor unit receives generated radiation that travels through the structure. The prior art methods do not operate at exposure wavelengths that can penetrate a structure for detection of moisture inside of the structure. Claims 27, 28, and 29 recite that the sensor unit comprises spectrometer, spectroradiometer, and hyperspectral imaging system. The prior art methods fail to disclose use of any of these devices to actively expose and sense radiation at a detection wavelength that is derived from an exposure wavelength that is absorbed by water, to determine whether a water-suspect area exists in a structure. Claims 32-49, many of which are disclosed in Applicant's U.S. Patent No. 5,886,636, are new in combination with the other recited steps of these Claims, and can be used to test a water-suspect area to confirm it to include water and to determine the source of the water. Claim 45 recites a method to detect a water-soluble substance that is itself similar to Claim 18 but rather than water is applied to detecting water-soluble substances such as salts that may reveal the presence of ground water in a structure. The prior art fails to disclose this method of detecting water-soluble substances. Hence, Claims 45-48, which all recite these limitations, are also patentable for this additional reason. Claim 51 recites that the predetermined area of the structure that is exposed with radiation is at least one square meter. The prior art methods are incapable of actively scanning an area of this scale, which reduces the time and repositioning of equipment necessary to scan a structure. Claims 52 and 53 recite that the structure is a house and building, respectively. The recited methods have not been applied to such structures such as houses or buildings.

Accordingly, it is submitted that Claims 19-21, 23-25, 27-32, 34-37, and 39-53 as amended are patentable over the prior art methods and equipment.

5. Identify Any Use of the Subject Matter in Claims 8, 10-13, 16-32, 34-37 and 39-53 known to any of the Inventors at the Time the Application was Filed Notwithstanding the Date of Such Use

Applicant believes that none of the subject matter of Claims 8, 10-13, 16-32, and 39-53 was in public use as of the date of filing the application.

6. Waiver of Fee and Certification Requirements under 37 C.F.R. §1.97 in Response to Reply to Requirement under 37 C.F.R. §1.105

As indicated at page 3, item 4 of the Requirement, Applicant acknowledges that fee and certification requirements are waived for the attached documents submitted in reply to this requirement under 37 C.F.R. §1.105.

7. Duty of Candor and Good Faith under 37 C.F.R. §1.56

In response to page 3, item 5 of the Requirement, Applicant acknowledges duty of candor and good faith under 37 C.F.R. . §1.56 and believes it has fully complied with its provisions.

Summary

It is submitted that Applicant has fully responded to the Requirement for Information and hereby requests favorable examination of Claims 8, 10-13, 16-21, 23-25, 27-32, 34-37, and 39-53 as amended.

If the Examiner has any question regarding this Amendment, the Examiner is requested to contact the undersigned at the telephone number indicated below.

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Respectfully submitted,

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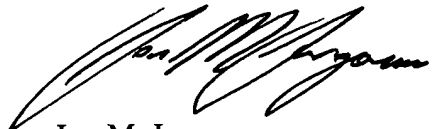

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